Curriculum vitae

Carlee E. Ashley, Ph.D.
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Current Position

Owner, *CarnCo Stabilization Solutions, Lincoln, NE. July 2016 – present*
Partner and manager of women-owned small business performing R&D for USG contracts and developing novel materials and solutions for stabilizing precious biological reagents, including antibodies, enzymes, and live cells.

Educational Background

Ph.D., University of New Mexico, May 2010

- Chemical Engineering with a Concentration in Nanoscience and Microsystems
  GPA 4.2/4.0; Graduated with Distinction
  Dissertation Title: '*Multivalent Display of Peptides on Virus-like Particles of MS2 Bacteriophage for Materials Science and Biomedical Applications*'

Bachelor of Science, University of New Mexico, May 2005

- Major: Biochemistry and Molecular Biology
  GPA: 4.2/4.0, Graduated *Summa cum Laude*

Recent Outside Employment

Technical Staff, *Sandia National Laboratories, Biological and Materials Science Center, Albuquerque, NM.* July 2013 – July 2016.
Medical and biodefense applications of nanomaterials with emphasis on (1) development of complex random peptide libraries displayed on virus-like particles for use in rapid vaccine development and (2) use of nanoporous particle-supported lipid bilayers (protocells) for targeted delivery of therapeutics and diagnostics to cancer, virally-infected cells, and pathogenic bacteria.

President Harry S. Truman Fellowship in National Security Science and Engineering
Sandia National Laboratories, Bioengineering and Biotechnology Dept., Livermore, CA.
July 2010 – July 2013.

- Truman Project: 'Biodefense and Emerging Infectious Disease Applications of Engineered Nanoparticles'
- Used random peptide libraries displayed on virus-like particles to identify vaccines against Nipah and Hendra viruses using only neutralizing antibodies. Adapted mesoporous silica nanoparticle-supported lipid bilayers ('protocells') for delivery of small molecule antibiotics and antivirals, nucleic acid-based therapies, and various antigens. Developed protocells capable of penetrating the blood-brain barrier for applications involving nerve agent countermeasure delivery and treatment of traumatic brain injury. Worked to adapt metal organic frameworks (MOFs) for delivery of antibiotics and adjuvants.

Research Interests

Bio/nanomaterials and bioinspired materials formed via self-assembly; tailored bio/nano interfaces; bio/nanocomposite materials development, nanomaterials templating for biosensing, biodefense and nanotoxicology studies. Evaporation-induced self-assembly of engineered bio-nanoparticles into 2D structures, Platform development and tailoring biomolecule surfaces for specific binding and functionality to selectively deliver/release cargo for therapy and diagnostics. Integration of nanoscience with cell/molecular biology, e.g. inserting cancer cells into lipid-templated silica nanostructures to induce non-replicative persistant populations of cells for screening against random peptide libraries and drugs. Development of novel materials for delivery of therapeutics and countermeasures important to rare and infectious disease therapies and biodefense. Design and oversight of *in vitro* and *in vivo* studies.

Research Impact

Dr. Ashley authored the proposal for a SNL $10.8M DTRA project to develop nanoparticle therapeutics for combating infectious disease which was awarded in Oct 2013. She was the overall technical lead of the project which received highly favorable reviews during site visits and formal programmatic reviews at DTRA headquarters. She also authored additional DTRA proposals during this time period – one on development of nanoparticles for delivery of chemical and biological countermeasures to the central nervous system was recently funded for $5M. The SNL/UNM protocell nanoparticle technology, invented by Dr. Ashley, has been recognized by four primary papers published since 2009 including a cover article in Nature Materials 2011 (CE Ashley first author, 496 citations as of August 2016). Protocell technology was awarded a comprehensive U.S. Patent (US 8,734,818 B2 – *Porous Nanoparticle Supported Lipid Bilayer Nanostructures*) on May 27, 2014. The licensee of this technology supported the prosecution of >30 additional protocell patent applications throughout the world. Recently, Dr. Ashley authored a Sandia Laboratory Directed Research and Development (LDRD) Grand Challenge proposal on new delivery platforms for developing CRISPR technology for applications in biodefense as well as for cancer and rare and infectious disease. This $14M proposal was selected for funding and involves ~20 Ph.D. staff members representing multiple research centers across the NM/CA laboratories. Dr. Ashley was noted to be the most-junior staff member and only woman ever chosen to serve as PI of these high-profile projects, whose progress is reported directly to Congress and the Secretary of Energy. Since leaving the national laboratories, Dr. Ashley has dedicated herself to assisting in the creation of multiple women-owned small businesses within the STEM space. Carlee is currently co-owner and manager of one of these small businesses, CarnCo Stabilization Solutions, providing novel materials solutions for commercial and government entities requiring preservation of sensitive biological reagents.

Technical Expertise

- Synthesis, structure tailoring, characterization, and applications of bio/nanomaterials for applications in biodefense, cancer, rare diseases.
- Expert microscopist including Confocal Fluorescence Microscopy, Scanning and Transmission Electron Microscopy, and Atomic Force Microscopy; flow cytometry, ATR-FTIR, X-ray Diffraction and Reflectivity, SAXS, GISAXS, ellipsometry, various chromatographic and spectroscopic techniques; culture of tissues, yeast, bacteria and viruses; extensive materials science, biochemical and microbiological methods. Experimental design and protocol development for *in vitro* and *in vivo* studies.

- Biosafety Level 2 operations and management in National Lab and University Laboratories - ten years' experience. Design and management of *in vitro* and *in vivo* BSL-3 studies.

Teaching and Other Work Experience

Graduate Research Assistant - University of New Mexico, Department of Chemical and Nuclear Engineering, Albuquerque, New Mexico. August 2005 - May 2010.

- First co-advised graduate student between Department of Chemical and Nuclear Engineering (C.J. Brinker) and Molecular Genetics and Microbiology (D.S. Peabody); independently developed graduate research project to bridge the nanoscience vs. nanomedicine research interests of these departments, recruited Cancer Center mentors and assembled the diverse technical resources needed for this research.
- Served as resource to Brinker group materials scientists and engineers on biochemical and biomolecular concepts and methods. Mentored many undergraduate students (National Lab interns, NSF-REU students, visiting summer students, year-round university interns) including project definition, protocol and safety plan development, biochemistry/materials science lab techniques, advanced microscopy, analysis and presentation of student results at local technical conferences.
- Presented work at national/international technical conferences; wrote major sections for proposals to NIH and AFOSR; authored or co-authored manuscripts submitted to Science, JACS, and Nature. Co-author of project reports and presentations to sponsors.

Graduate Teaching Assistantships

- ChNE 461, Chemical Reactor Engineering (Kinetics). Fall 2008. Department of Chemical and Nuclear Engineering, The University of New Mexico, Albuquerque, New Mexico.

- ChNE 302, Chemical Engineering Thermodynamics. Spring 2008. Department of Chemical and Nuclear Engineering, The University of New Mexico, Albuquerque, New Mexico.

- ChNE 311, Fundamentals of Momentum and Heat Transfer. Fall 2007. Department of Chemical and Nuclear Engineering, The University of New Mexico, Albuquerque, New Mexico.

- CHEM131L, Enriched Introductory Chemistry. August 2005-May 2006. Department of Chemistry, The University of New Mexico, Albuquerque, New Mexico.

Master Teacher - University Honors Program, The University of New Mexico, Albuquerque, New Mexico. Developed and presented course proposal to the Honors Department, developed curriculum and resource materials for 16-week course, *From Science in an Age of Religion to Religion in an Age of Science*; mentored a Senior level student teacher as her University Honors project. Spring 2010.

Instructor – The University of New Mexico, University Honors Program, Albuquerque, New Mexico. Developed new course proposal and curriculum and taught 16-week *Nanotechnology Seminar*. Spring 2009.

Instructor – The University of New Mexico, School of Engineering, Albuquerque, New Mexico. Spring 2008. Contributed to curriculum development and team-taught 16-week *Engineering Ethics*

with Department of Philosophy faculty and graduate students. Repeated this course at Central NM Community College, Albuquerque, NM. Fall 2008.

Instructor – The University of New Mexico, University Honors Program, Albuquerque, New Mexico. Developed course proposal/curriculum and taught 16-week *Societal and Ethical Implications of Nanotechnology*. Fall 2007.

Graduate Student Intern - Sandia National Laboratories, Department of Geochemistry, Albuquerque, New Mexico. March 2006 - December 2006.

- Performed research to develop coagulant systems for rapid, non-carcinogenic decontamination of pathogen-ridden water in compliance with EPA standards.
- Mentored 4 undergraduate students and 2 students participating in the NSF-funded REU program.

Undergraduate Student Intern - Sandia National Laboratories, Department of Ceramics and Glass, Albuquerque, New Mexico. May 2005 - August 2005.

- Conducted an independent research project to develop optically-patterned microarrays of living cells on self-assembled inorganic host matrices.
- Mentored 6 students (1 undergraduate, 2 REU students, and 3 high school students).

Student Technical Specialist (undergraduate) – The University of New Mexico, Center for Micro-Engineered Materials, Albuquerque, New Mexico. August 2002 - May 2005.

- Designed and performed experiments to develop cell-based biosensors capable of detecting toxins and pathogenic microorganisms and producing a quantifiable signal. Trained and mentored new students in bio-laboratory operations and protocols.
- Contributed, as second author, to a Science manuscript published in 2006 (Baca, et al.) Prepared and delivered posters and presentations at local/regional technical meetings.

Student Teacher – The University of New Mexico, University Honors Program, Albuquerque, New Mexico. *Fearful Frontier: The Uneasy Border Between Science and Religion*. Co-developed course proposal, curriculum and resource materials with Honors faculty member and served as student teacher. Fall 2004.

Senior Education Assistant – The University of New Mexico School of Medicine, Department of Biochemistry, Albuquerque, New Mexico. August 2004 - December 2004.

- Assisted in large lecture and lab-based biochemistry classes by contributing exam questions, grading exams and homework, preparing/delivering selected lecture topics, and conducting office hours, problem sessions and review sessions.
- Participated in associated research methods course designed for prospective professors to assess and develop strategies to improve how students learn science.

Mentoring Experience

A variety of students at various levels and other technical trainees are mentored in my laboratories. Trainees receive rigorous mentoring and hands-on training in bio/nanomaterial synthesis and characterization, as well as microbiological/biochemical techniques and characterization. Students receive not only technical mentoring but are also coached in organizing and conducting meetings, planning and directing research, and instruction in the interpretation and organization of data. They

are given many opportunities to develop and polish effective oral and written communication of results. All graduate students and post-docs are active participants in proposal development. Advanced undergraduate students are encouraged to participate in preparation of technical manuscripts. Assistance with career counseling, job placement, and graduate school and professional school applications is also provided.

- **Post-doctoral associates, current**
    - Brandon Slaughter, PhD Biomedical Engineering, University Texas-Austin
    - Christopher Lino, PhD Biomedical Sciences, University of New Mexico
    - Amber McBride, PhD Nanoscience and Microsystems Engineering, University of New Mexico
- **Graduate Students:**
    - David Padilla (UNM Biomedical Engineering/PharmD, expected graduation May 2017)
    - Caroline Bouvie (UNM MS Biomedical Engineering, expected graduation spring 2017)
    - Andrew Gomez (UNM MS Biomedical Engineering, July 2015)
    - Robin Sewell Kalinich (UNM BS Chem Eng, MS NSMS, May 2013)
    - Mekensey Buley (UNM MS Biomedical Engineering May 2012)

- **Undergraduate Students:**
    - Katharine Epler (UNM B.S. Chemical Engineering; year round student for 5 years. First Author *Advanced Healthcare Materials* paper, 2012; currently UNM School of Medicine.)
    - Mekensey Buley (Oklahoma State University, B.S. Chemical Engineering; REU student who returned as a grad student; MRS Best Poster contributor)
    - David Padilla (UNM Chemistry; mentored for 7yrs; currently UNM PharmD/PhD program)
    - Tracey Hanna (U. Florida, B.S. Chemical Engineering, REU student; contributor to Nature Materials paper, 2011)
    - Cynthia Douthit (UNM B.S. Chemical Engineering, currently employed at Intel)
    - Page Brown (UNM B.S. Chemistry; UNM School of Medicine)
    - Jennifer Pelowitz (UNM B.S. Biochemistry, M.S. Nanoscience and Microsystems; currently at Sandia National Labs)
    - Deanna Lopez (UNM B.S. Chemical Engineering, currently Sandia National Labs)

- **High School Students:**
    - Adriana Herrera (Volcano Vista High School, Albuquerque; to Baylor)
    - Elias Marquez (Sandia High School, Albuquerque to UNM)

Fellowships/Schlorships, Awards/Honors, and Memberships

Fellowships and Scholarships

- President Harry S. Truman Fellowship in National Security Science and Engineering, Sandia National Laboratories. 2010-2013. Two Fellows are selected each year following a nation-wide search, submission of a comprehensive research proposal, and intensive interviews with staff/managers, Executive management and search committees at Sandia sites in New Mexico and California.

- Ethics Fellow, the University of New Mexico, National Science Foundation Pilot Program between School of Engineering and Department of Philosophy graduate students to develop and team-teach an *Engineering Ethics* course. 2007-2008.
- Integrated Graduate Education and Research Traineeship (IGERT) in Nanoscience and Microsystems, National Science Foundation. 2006-2009.
- Regents' Scholar (highest undergraduate scholarship), The University of New Mexico. 2000-2004.

Awards and Honors – Personal/Team

- Commendation from DoD official to Sandia Director Jill Hruby recognizing the Carnes' team technical contributions and leadership: "Dr. Eric Carnes and his team, including Carlee Ashley, Patrick Fleig, Marissa Conroy, Scott Reed, Wes King, Jennifer Pelowitz, Trevin Heisey, Brian Wilkinson, and Claire Melo were instrumental in our success. . . . Eric and his team were relentless in their dedication to this effort and creative in solving some of our hardest technical problems." December 1, 2015
- Marissa Anderson, Patrick Fleig, Jeff Brinker, Eric Carnes, **Carlee Ashley**. Selective, Long-Term Transfection of Dividing and Non-Dividing Cells Using Plasmid DNA, 27th Rio Grande Symposium on Advanced Materials, Albuquerque, NM, October 2, 2015, **Outstanding Graduate Student/Technologist Poster Award**.
- Materials Research Society, Spring 2014: Symposium Y: Biomaterials for Biomolecule Delivery and Understanding Cell-Niche Interactions , Bouvie, C.; Epler, K.; Padilla, D.; Gomez, A.; Anderson, M.; Fleig, P.; Chackerian, B.; Brinker, C. J.; **Ashley, C. E.**; Carnes, E. C. Mesoporous Oxide Nanoparticles for Controlled Release and Targeted Delivery of Antigens, San Francisco, CA, April 2014. **Best Poster, Symposium Y Award**.
- Federal Laboratory Consortium for Technology Transfer, Mid-Continent Region, "Outstanding Regional Partnership" awarded to UNM Health Sciences Center/SNL, Willman CL, Brinker CJ, Peabody DS, Chackerian B, Ashley CE, and **Carnes EC**. October 21, 2013.
- Padilla DP, **Ashley CE**, Carnes EC, Epler KE, Castillo RE, Bouvie C, Wilkinson D, Johannes N, and Brinker CJ. *Development of Porous Nanoparticle-Supported Lipid Bilayers (Protocells) for Targeted Delivery of Plasmid DNA to Hepatocellular Carcinoma.* American Vacuum Society – The Science & Technology Society, Albuquerque, NM. May 24, 2011. **Best Poster Award**
- **Carlee Ashley --** Outstanding Graduate Student 2010, Chemical and Nuclear Engineering, The University of New Mexico, Albuquerque, New Mexico.
- **Team led by Carlee Ashley --** Michael Gallegos Prize for Entrepreneurship, $25K, The University of New Mexico Technology Business Plan Competition, Albuquerque, New Mexico. April 2010.
- **Carlee Ashley --** Materials Research Society Graduate Student Silver Medal, Fall 2009 meeting, Boston, MA. November 30 – December 4, 2009.
- Materials Research Society Fall 2008 meeting, Boston, MA. **1st Place Poster Award**, Open poster competition (599 entries). *Targeted in-vitro delivery of a chemotherapeutic agent to human hepatocarcinoma via a bacteriophage carrier*. **Ashley CE**, Buley M, Peabody DS, and Brinker CJ. December 1-5, 2008
- Materials Research Society Fall 2008 meeting, Boston, MA. **Top Ten Poster Award**, Open poster competition (609 entries). *Self-assembly of well-ordered, close-packed 2D arrays of recombinant virus-like particles that nucleate the growth of inorganic nanomaterials.* **Ashley CE**, Dunphy DR, Carnes EC, Petsev D, Atanassov P, Peabody DS, and Brinker CJ. December 1-5, 2008.
- American Vacuum Society Graduate Student Oral Paper Competition, **1st Place award, Best paper** (paid trip to AVS 54th International Symposium in Seattle), 43rd Annual Meeting of the American Vacuum Society, Albuquerque, New Mexico. *Grazing Incidence Small Angle X-Ray*

Scattering (GISAXS) Characterization of 2D Bacteriphage Arrays Deposited via Convective Assembly. **Ashley CE**, Dunphy DR, Atanassov P, Petsev D, and Brinker CJ. May 2007.

- Industrial Advisory Board Meeting of the UNM/Rutgers/Penn State Ceramic and Composite Materials Center (CCMC), Albuquerque, NM. **First Prize, Graduate student poster competition**. *Cell-Directed Assembly of 3-D Bio-Nano Interfaces.* **Ashley CE**, Carnes EC, Baca HK, Lopez DM, Singh S, and Brinker CJ. March 13, 2007.
- **Carlee Ashley** -- Robert Loftfield Award for Excellence in Academics and Research, The University of New Mexico, Albuquerque, New Mexico. 2005.

Memberships in Professional Societies

- Materials Research Society, 2005 – present.
- American Chemical Society, student member 2005-2010.
- American Institute of Chemical Engineers, student member 2005-2010.
- Golden Key Honors Society, 2002; Phi Kappa Phi, 2003; Phi Beta Kappa, 2004.

Outreach/Media Recognition

- STC UNM News, *Joint Protocell Technology Receives Funding from DOD*, January 8, 2014
- STC UNM News, *UNM's Protocell Technology Attracts Successful Entrepreneur, Investor and Pioneer in Emerging Cancer Therapies,* December 13, 2013
- Albuquerque Journal feature article *'Protocell' therapy gains future backer*, Kevin Robinson-Avila, Dec 9, 2013; http://www.abqjournal.com/316517/biz/protocell-therapy-gains-potent-backer.html.
- KOAT TV – A vision for nanoparticle-based drug delivery: *New Cancer Treatment Being Studied in Albuquerque*, December 17, 2013; http://www.koat.com/news/new-mexico/albuquerque/New-cancer-treatment-being-studied-in-Albuquerque/-/9153728/23525492/-/14gkxq2z/-/index.html
- Undergraduate students from the Ashley-Carnes lab participated in SNL's CSI Dognapping Outreach program, Jan 2013-2016. For this week-long event, 500 4th graders (selected from schools with near-100% eligibility for state and federal lunch programs) come to AML every January for ½ day each to participate in a Chemistry Magic Show that, when the canine assistant is dognapped, turns into a hands-on scientific investigation of evidence at the scene to identify the culprit and free the dog. This annual event has been recognized by state and local press and the ACS (recipient of the 2015 American Chemical Society *ChemLuminary* award). Following the 2014 event, representatives from each New Mexico Congressional visited AML for briefings and tours of K-12 Outreach sites (including Dognapping) and returned to visit with mentored students in summer 2016.

Publications

1. Jones, Christopher G.; Stavila, Vitalie; Conroy, Marissa; Feng, Patrick; Slaughter, Brandon V.; **Ashley, Carlee**; and Allendorf, Mark D. Versatile Synthesis and Fluroescent Labeling of ZIP-90 Nanoparticles for Biomedical Applications. *Applied Materials and Interfaces 2016, 8, 7623-7630.*
2. Butler, K. S.; Durfee, P. N.; Theron, C.; **Ashley, C. E.**; Carnes, E. C.; Brinker, C. J. Protocells: Modular Mesoporous Silica Nanoparticle-Supported Lipid Bilayers for Drug Delivery. *Small* 2016, *12*, 2173-2185.

3. Pascal, J.; **Ashley, C. E**.; Wang, Z. H.; Brocato, T. A.; Butner, J. D.; Carnes, E. C.; Koay, E. J.; Brinker, C. J.; Cristini, V.: Mechanistic Modeling Identifies Drug-Uptake History as Predictor of Tumor Drug Resistance and Nano-Carrier-Mediated Response. ACS Nano 2013, 7, 11174-11182.
4. Tarn, D.; **Ashley, C. E.;** Xue, M.; Carnes, E. C.; Zink, J. I.; Brinker, C. J.: Mesoporous Silica Nanoparticle Nanocarriers: Biofunctionality and Biocompatibility. *Accounts of Chemical Research* 2013, 46, 792-801.
5. Epler, K. E., Padilla, D., Phillips, G., Crowder, P., Castillo, R., Wilkinson, D., Wilkinson, B., Burgard, C., Kalinich, R., Townson, J. L., Chackerian, B., Willman, C.L., Peabody, D.S., Wharton, W., Brinker, C. J., **Ashley, C. E.,** Carnes, E. C. Delivery of Ricin Toxin A-Chain by Peptide-Targeted Mesoporous Silica Nanoparticle-Supported Lipid Bilayers. *Advanced Healthcare Materials* 2012, *1* (3) 348-353. **(COVER).**
6. **Ashley, C. E.**, Carnes, E. C., Epler, K. E., Padilla, D. P., Phillips, G. K., Castillo, R. E., Wilkinson, D. C., Wilkinson, B. S., Burgard, C., A.; Kalinich, R. M., Townson, J. L., Chackerian, B., Willman, C. L., Peabody, D. S., Wharton, W., Brinker, C. J. *Delivery of Small Interfering RNA by Peptide-Targeted Mesoporous Silica Nanoparticle-Supported Lipid Bilayers*. *ACS Nano* 2012, *6*, 2174-2188. **(COVER).**
7. **Ashley, C. E.**, Carnes, E. C., Phillips, G. K., Durfee, P. N., Buley, M. D., Lino, C. A., Padilla, D. P., Phillips, B., Carter, M. B., Willman, C. L., Brinker, C. J., Caldeira, J. d. C., Chackerian, B., Wharton, W., Peabody, D. S. *Cell-Specific Delivery of Diverse Cargos by Bacteriophage MS2 Virus-like Particles*. *ACS Nano* 2011, *5*, 5729-5745. **(COVER).**
8. **Ashley, C. E.**, Carnes, E. C., Phillips, G. K., Padilla, D., Durfee, P. N., Brown, P. A., Hanna, T. N., Liu, J., Phillips, B., Carter, M. B., Carroll, N. J., Jiang, X., Dunphy, D. R., Willman, C. L., Petsev, D. N., Evans, D. G., Parikh, A. N., Chackerian, B., Wharton, W., Peabody, D. S., Brinker, C. J. *The targeted delivery of multicomponent cargos to cancer cells by nanoporous particle-supported lipid bilayers*. *Nat Mater* 2011, *10*, 389-397. **(COVER,** with commentary by Irvine, D. J., One nanoparticle, one kill. *Nature Materials News & Views* 2011, 2010, 2342).
9. **Ashley, C. E.**, Dunphy, D. R., Jiang, Z., Carnes, E. C., Yuan, Z., Petsev, D. N., Atanassov, P. B., Velev, O. D., Sprung, M., Wang, J., Peabody, D. S., Brinker, C. J. *Convective Assembly of 2D Lattices of Virus-like Particles Visualized by In-Situ Grazing-Incidence Small-Angle X-Ray Scattering*. *Small* 2011, *7*, 1043-1050.
10. Baca, H. K., Carnes, E. C., **Ashley, C. E.**, Lopez, D. M., Douthit, C., Karlin, S., Brinker, C. J. Cell-directed-assembly: *Directing the formation of nano/bio interfaces and architectures with living cells*. *Biochimica et Biophysica Acta (BBA) - General Subjects* 2011, *1810*, 259-267.
11. Harper, J. C., Khirpin, C. Y., Carnes, E. C., **Ashley, C. E.**, Lopez, D. M., Savage, T., Jones, H. D. T., Davis, R. W., Nunez, D. E., Brinker, L. M., Kaehr, B., Brozik, S. M., Brinker, C. J. *Cell-Directed Integration into Three-Dimensional Lipid-Silica Nanostructured Matrices*. *ACS Nano* 2010, *4*, 5539-5550.
12. Carnes, E. C., Harper, J. C., **Ashley, C. E.**, Lopez, D. M., Brinker, L. M., Liu, J. W., Singh, S., Brozik, S. M., Brinker, C. J. *Cell-Directed Localization and Orientation of a Functional Foreign Transmembrane Protein within a Silica Nanostructure*. *Journal of the American Chemical Society* 2009, *131*, 14255-14257.
13. Liu, J. W., Jiang, X. M., **Ashley, C. E.**, Brinker, C. J. *Electrostatically Mediated Liposome Fusion and Lipid Exchange with a Nanoparticle-Supported Bilayer for Control of Surface Charge, Drug Containment, and Delivery*. *Journal of the American Chemical Society* **2009**, *131* (22) 7567-7569.
14. Baca, H. K., Carnes, E. C., Singh, S., **Ashley, C. E.**, Lopez, D., Brinker, C. J. *Cell-Directed Assembly of Bio/Nano Interfaces: A New Scheme for Cell Immobilization*. *Accounts of Chemical Research* 2007, *40*, 836-845.

15. Baca, H. K., **Ashley, C. E.**, Carnes, E. C., Lopez, D., Flemming, J., Dunphy, D., Singh, S., Chen, Z., Liu, N. G., Fan, H. Y., Lopez, G. P., Brozik, S. M., Werner-Washburne, M., Brinker, C. J. *Cell-directed assembly of lipid-silica nanostructures providing extended cell viability*. *Science* **2006**, *313*, 337-341.

Intellectual Property Development

Patents Awarded

- *Protocells and Their Use for Targeted Delivery of Multicomponent Cargoes to Cancer Cells*, C.J. Brinker, C.E. Ashley, X.M. Jiang, J. Liu, D.S. Peabody, W. Wharton, E.C. Carnes, B. Chackerian, C.M. Willman, U.S. Patent 8,992,984 B1; March 31, 2015.
- *Porous Nanoparticle Supported Lipid Bilayer Nanostructures,* J. Liu, C. Jeffrey Brinker, C.E. Ashley, and E.C. Carnes, U.S. Patent 8,743,816; May 27, 2014.

Patent Applications

- CRLF-2 Binding Peptides, Protocells and Virus-Like Particles Useful in the Treatment of Cancer, including Acute Lymphoblastic Leukemia (ALL), U.S. Patent Application 2015/0010475 A1, published January 8, 2015
- Protocell Particles for Sustained Delivery of Antibiotics, PCT/US2014/32702, 4/2/2014
- Mesoporous Alum Nanoparticles as a Universal Platform for Antigen, Adsorption, Presentation, and Delivery, PCT/UIS2014/32711, 4/2/2014.
- Plasmid delivery in the treatment of cancer and other disease states, Provisional, 62/057,968; 9/30/2014
- Porous nanoparticle-supported lipid bilayers (protocells) for targeted delivery including transdermal delivery of cargo and methods thereof, PCT/US2012/060072, 2013-2014, Multiple foreign applications.
- Porous Nanoparticle-Supported Lipid Bilayers (Protocells) for Targeted Delivery and Methods of Using Same, PCT/US12/35539, 4/27/2012
- The Selective Transfection of Hepatocellular Carcinoma Using Peptide-Targeted Silica Nanoparticle-Supported Lipid Bilayers (Protocells), Provisional application 61/479,847, 4/28/2011.
- Delivery of Therapeutic Macromolecular Cargos by Targeted Protocells, Provisional application 61/577,410, 12/19/2011.
- CRLF-2 Targeted VLPs for Leukemia Delivery, Provisional application 61/581,915, 12/30/2011.
- Porous Nanoparticle Supported Lipid Bilayer Nanostructures for Drug Delivery, Imaging, and Biomedical Diagnostics, Application 13/143,164, 1/5/2010.
- Virus-like Particles as Targeted Multifunctional Nanocarriers for Delivery of Drugs, Therapeutics, Sensors and Contrast Agents to Arbitrary Cell Types, 12/960,168; 12/3/2010.
- Peptide-Directed, Porous Nanoparticle-Supported Lipid Bilayers: a Universal Platform for Targeted Delivery of Multicomponent Cargos to Human Cancer Cells, Provisional, 61/306,123; 2/19/2010.
- The Selective Transfection of Hepatocellular Carcinoma Using Peptide-Targeted Silica Nanoparticle-Supported Lipid Bilayers (Protocells), STC 2011-098, Provisional application 61/479,847, 4/28/2011.
- Delivery of Therapeutic Macromolecular Cargos by Targeted Protocells, STC 2012-047, Provisional application 61/577,410, 12/19/2011.

Presentations at Technical Conferences, Authored or Co-Authored

1. Slaughter, Brandon Vaughn; Lino, Christopher A; McBride, Amber Alane Fisher; Fleig, Patrick F.; Conroy, Marissa Anderson; Melo, Claire Francesca; Wilkinson, Brian Scott ; Garcia, Gabriel; Wu, Terry; Adolphi, Natalie; Reed, Scott; Ashley, Carol S.; Brinker, Jeffrey C.; Carnes, Eric Christopher;

Ashley, Carlee Erin. *Mesoporous Silica Nanoparticle-Supported Lipid Bilayers for Targeted Antibiotic Therapeutics (*Poster), 10th World Biomaterials Congress in Montreal, May 17-22, 2016, Quebec, Canada.

2. Brandon V. Slaughter; Chris Lino; Amber McBride; Patrick Fleig; Marissa Anderson; Claire Melo; Brian Wilkinson; Gabriel Garcia; Terry Wu; Natalie Adolphi; Scott Reed; Carol Ashley; Jeff Brinker; Eric Carnes; **Carlee Ashley**, Protocells for Targeted Antibiotic Therapy, Oral Presentation, Materials Research Society Spring Meeting, SM7.4: Future Healthcare Needs through Biomaterials, Bioengineering and the Cellular Building Block III, Mar 28-Apr 1, 2016. Phoenix, AZ.
3. Brandon Slaughter, Chris Lino, Patrick Fleig; Marissa Anderson; Claire Melo; Brian Wilkinson; Gabriel Garcia; Terry Wu; Natalie Adolphi; Jeff Brinker; Eric Carnes; **Carlee Ashley**, Recovering the Efficacy of Antibiotics Using Nanoparticles Targeted to Sites of Bacterial Infection (INVITED presentation), Materials Research Society Spring Meeting, Symposium NT6: Colloidal Nanoparticles—From Synthesis to Applications, Mar 28-Apr 1, 2016. Phoenix, AZ
4. **Carlee Ashley**, Brandon Slaughter, Chris Lino, Marissa Anderson Conroy, Patrick Fleig, Andrew Gomez, Brian Wilkinson, Claire Melo, and Eric Carnes. Targeted Delivery of Antibiotics to Cells Infected with *Burkholderia pseudomallei* using Mesoporous Silica Nanoparticle-Supported Lipid Bilayers**,** Nano for Defense Conference: Transitioning Emerging Technologies, Nov 16-19, 2015. City of Industry, CA.
5. **Carlee Ashley**, Trevin Heisey, Andrew Gomez, Marissa Anderson Conroy, Chris Lino, Eric Carnes. Mesoporous Oxide Nanoparticles for Controlled Release and Targeted Delivery of Antigens for Superior Vaccines and Adjuvants, Nano for Defense Conference: Transitioning Emerging Technologies, Nov 16-19, 2015. City of Industry, CA.
6. **Carlee Ashley**, Early Career Sandia Researcher Technical Session, Executive Visit by The Honorable Barbara Mikulski, US Senator (D-MD), The Honorable Martin Heinrich, US Senator (D-NM), and The Honorable Tom Udall, US Senator (D-NM), Material Science Nano-Technology Applications (INVITED), Sandia National Laboratories, Albuquerque, NM, Oct 14, 2015.
7. Marissa Anderson, Patrick Fleig, Jeff Brinker, Eric Carnes, **Carlee Ashley**. Selective, Long-Term Transfection of Dividing and Non-Dividing Cells Using Plasmid DNA, 27th Rio Grande Symposium on Advanced Materials, Albuquerque, NM, October 2, 2015, Outstanding Graduate Student/Technologist Poster Award.
8. Brandon Slaughter, Patrick Fleig, Brian Wilkinson, Claire Melo, Eric Carnes, **Carlee Ashley**. Development of Mesoporous Silica Nanoparticle-Supported Lipid Bilayers for Targeted Antibiotic Therapeutics, 27th Rio Grande Symposium on Advanced Materials, Albuquerque, NM, October 2, 2015.
9. Brandon Slaughter, Chris Lino, Marissa Anderson, Patrick Fleig, Andrew Gomez, Claire Melo, Gabriel Garcia, Brian Wilkinson, Terry Wu, Linda Felton, David Padilla, Natalie Adolphi, Caroline Bouvie, Amber McBride, Pavan Muttil, Scott Reed, Jeff Brinker, Eric Carnes, **Carlee Ashley**. Targeted Delivery of Antibiotics to Cells Infected with B*urkholderia pseudomallei* using Mesoporous Silica Nanoparticle-Supported Lipid Bilayers, Sandia Biosciences Programs, External Advisory Board, Sandia National Laboratories, Albuquerque, NM July 21-23, 2015.
10. **Ashley CE** and EC Carnes, Targeted Protocells for Treatment of Infectious Disease, University of New Mexico Cancer Center, Sandia National Laboratories, and Los Alamos National Laboratory, Annual Research Retreat, June 26, 2015, Albuquerque, NM (Invited)
11. Slaughter BV, Lino CA, Anderson ME, Fleig PF, Gomez A, Melo CF, Bouvie C, Chackerian B, **Ashley CE**, Mesoporous Oxide Nanoparticles for Controlled Release and Targeted Delivery of Antigens,

Chemical and Biological Defense Science and Technology Conference, St Louis, MO, May 12-14, 2015.

12. **Ashley CE**, Epler KE, Anderson MR, Padilla DP, Fleig PF, Brinker CJ, and Carnes EC, Targeted Delivery of Antibiotics to Cells Infected with *Francisella Tularensis* using Mesoporous Silica Nanoparticle-Supported Lipid Bilayers, Chemical and Biological Defense Science and Technology Conference, St Louis, MO, May 12-14, 2015.
13. **Ashley CE**, Bouvie C, Lino CA, Anderson MR, Fleig PF, Brinker CJ, and Carnes EC, Mesoporous Oxide Nanoparticles for Controlled Release and Targeted Delivery of Antigens, Materials Research Society Spring 2015 Meeting, Symposium KK—Nanomaterials in Translational Medicine (Poster), San Francisco, CA, April 6-10, 2015.
14. Carnes EC, Slaughter BV, Lino CA, McBride A, Anderson MR, Fleig PF, Gomez A, Bouvie C, Jackson M, Wilkinson BS, Melo CF, Brinker CJ, and **Ashley CE**, *Controlling the Biodistribution of Mesoporous Silica Nanoparticle-Supported Lipid Bilayers by Modulating Properties of the Bio/Nano Interface,* Materials Research Society Spring 2015 Meeting, Symposium GG: Foundations of Bio/Nano Interfaces–Synthesis, Modeling, Design Principles and Applications (Oral), San Francisco, CA, April 6-10, 2015.
15. Slaughter BV, Fleig PF, Gomez A, Melo CF, Garcia G, Reed ST, Bouvie C, Jackson M, Heisey T, Lino CA, Anderson MR, Brinker CJ, **Ashley CE**, and Carnes EC, *Overcoming Characterization Challenges of Bio-Inspired Nanomaterials,* Materials Research Society Spring 2015 Meeting, (Oral), San Francisco, CA, April 6-10, 2015.
16. Carnes EC, Epler KE, Padilla DP, Anderson MR, Fleig PR, Brinker CJ, and **Ashley CE**, *Selective, Long-Term Transfection of Dividing and Non-Dividing Cells using Plasmid DNA-Loaded Mesoporous Silica Nanoparticle-Supported Lipid Bilayers*, Materials Research Society Spring 2015 Meeting, Symposium GG: Foundations of Bio/Nano Interfaces–Synthesis, Modeling, Design Principles and Applications (Poster), San Francisco, CA, April 6-10, 2015.
17. **Ashley CE**, Lino CA, Slaughter BV, McBride A, *Anderson MR, Fleig PF, Gomez A, Bouvie C, Brinker CJ, and Carnes EC. Targeted Delivery of Antibiotics to Cells Infected with Francisella tularensis using Mesoporous Silica Nanoparticle-Supported Lipid Bilayers,* Materials Research Society Spring 2015 Meeting, Symposium KK—Nanomaterials in Translational Medicine (Oral), San Francisco, CA, April 6-10, 2015.
18. Townson JL, Lin Y, S, Durfee P, **Ashley CE** and Brinker C. Jeffrey, Protocells: Mesoporous silica nanoparticle supported lipid bilayers for targeted delivery, Fourth International Conference on Multifunctional Hybrid and Nanomaterials, Sitges/Barcelona, Spain, March 9-13, 2015. **INVITED.**
19. McBride, A.A., Lino, C., Price, D., Fleig, P., Carnes, E., **Ashley, C.**, Muttil, P., Lipid Bilayer Nanoparticles for Inhalational Delivery: A Potential Treatment Strategy against Tularemia (INVITED Oral), Gordon Research Seminar: Chemical & Biological Terrorism Defense, Ventura, CA, March 7-8, 2015.
20. McBride, A.A., Lino, C., Price, D., Fleig, P., Carnes, E., Ashley, C., Muttil, P., Lipid Bilayer Nanoparticles for Inhalational Delivery: A Potential Treatment Strategy against Tularemia (Poster), Gordon Research Seminar: Chemical & Biological Terrorism Defense, Ventura, CA, March 8-13, 2015.
21. Slaughter BV, Fleig PF, Gomez A, Melo CF, Garcia G, Reed ST, Bouvie C, Jackson M, Heisey T, Lino CA, Anderson MR, Brinker CJ, **Ashley CE**, and Carnes EC, *Overcoming Characterization Challenges of Bio-Inspired Nanomaterials* (Oral), Gordon Research Conference: Chemical & Biological Terrorism Defense, Ventura, CA, March 7-8, 2015.
22. Slaughter BV, Fleig PF, Gomez A, Melo CF, Garcia G, Reed ST, Bouvie C, Jackson M, Heisey T, Lino CA, Anderson MR, Brinker CJ, **Ashley CE**, and Carnes EC, *Overcoming Characterization Challenges of Bio-*

Inspired Nanomaterials (Poster), Gordon Research Seminar: Chemical & Biological Terrorism Defense, Ventura, CA, March 8-13, 2015.

23. **Ashley CE**, Bouvie C, Epler KE, Padilla DP, Gomez A, Anderson MA, Fleig P, Chackerian B, Carnes EC, Mesoporous Oxide Particles for Controlled Release and Targeted Delivery of Antigens, MedTech Showcase **(INVITED Oral and Poster)**, Pleasanton, CA, February 25, 2015
24. Lino CA, Wilkinson BS, Murton J, Hathaway H, Carnes EC, and **Ashley CE**, *Development of Porous Nanoparticles with Organophosphorus Bio-scavengers for Pre-Treatment*, 2014 DTRA Enzyme Program Review, Washington, DC, September 17, 2014
25. Carnes, E. C.; **Ashley, C. E**.; Williams, K.; Meagher, R.; Wu, M.; Negrete, O.; Fleig, P.; Anderson, M.; Epler, K.; Townson, J.; Lin, Y.-S.; Mold, C.; Hall, P.; Wu, T.; Felton, L.; Brinker, C. J.; Singh, A.: *Biodefense and Emerging Infectious Disease Applications of Engineered Nanoparticles*. In Bioscience External Review Board Meeting - BSAP: Livermore, CA. March 27, 2014. (Invited).
26. **Ashley CE** and Carnes EC, VLP (Virus-Like Particles) + Protocells, Bioscience External Review Board, Livermore, CA, March 4-6, 2014.
27. Bouvie C, Epler KE, Padilla DP, Gomez A, Anderson MR, Fleig PF, Chackerian B, Brinker CJ, **Ashley CE,** Carnes EC. *Mesoporous Oxide Nanoparticles for Controlled Release and Targeted Delivery of Antigens*. Materials Research Society Spring 2014 Meeting, Symposium Y: Biomaterials for Biomolecule Delivery and Understanding Cell-Niche Interactions (Oral), San Francisco, CA, April 21-25, 2014. **Best Poster Symposium Y award**.
28. Anderson MR, Epler KE, Padilla DP, Fleig PF, Brinker CJ, Carnes EC, **Ashley CE**. *Targeted Delivery of Antibiotics to Cells Infected with Francisella tularensis using Mesoporous Silica Nanoparticle-Supported Lipid Bilayers*. Materials Research Society Spring 2014 Meeting, Symposium Y: Biomaterials for Biomolecule Delivery and Understanding Cell-Niche Interactions (Oral), San Francisco, CA, April 21-25, 2014.
29. Padilla DP, Amaya L, Epler KE, Felton L, Brinker CJ, Carnes EC, **Ashley CE**. Nanoporous Particle-Tethered Multilamellar Lipid-Polymer Hybrids for Enhanced Gastrointestinal Stability and Oral Delivery of Antibacterial Agents. Materials Research Society Spring 2014 Meeting, Symposium Y: Biomaterials for Biomolecule Delivery and Understanding Cell-Niche Interactions (Oral), San Francisco, CA, April 21-25, 2014.
30. Epler KE, Padilla DP, Anderson MR, Fleig PF, Townson JT, Brinker CJ, Carnes EC, and **Ashley CE**. Targeted Delivery of Therapeutic Nucleic Acids to Hepatocellular Carcinoma via Mesoporous Silica Nanoparticle-Supported Lipid Bilayers. Materials Research Society Spring 2014 Meeting, Symposium Y: Biomaterials for Biomolecule Delivery and Understanding Cell-Niche Interactions, San Francisco, CA, April 21-25, 2014.
31. Lino CA, Epler KE, Chackerian B, Peabody DS, Carnes EC, **Ashley CE**. Rapid Selection of Nipah and Hendra Virus Vaccine Candidates from a Complex, Random Peptide Library Displayed on Virus-Like Particles of MS2 Bacteriophage. Materials Research Society Spring 2014 Meeting, Symposium U: Soft Nanomaterials (poster), San Francisco, CA, April 21-25, 2014.
32. **Ashley CE**, Epler KE, Padilla DP, Anderson MR, Fleig PF, Townson JT, Brinker CJ, and Carnes EC. Selective, Long-Term Transfection of Dividing and Non-Dividing Cells using Plasmid DNA-Loaded Mesoporous Silica Nanoparticle-Supported Lipid Bilayers. Materials Research Society Spring 2014 Meeting, Symposium Y: Biomaterials for Biomolecule Delivery and Understanding Cell-Niche Interactions, San Francisco, CA, April 21-25, 2014.
33. Carnes EC, Fleig PF, Anderson PF, Heisey T, Jackson M, Wilkinson BS, Epler KE, Townson JT, Brinker CJ, Negrete O, and **Ashley CE**. Targeted, Triggerable Delivery of Novel and Traditional Anti-Virals to Infected Cells via Biomimetic Hybrid Nanoparticles. Materials Research Society Spring 2014 Meeting, Symposium Y: Biomaterials for Biomolecule Delivery and Understanding Cell-Niche Interactions, San Francisco, CA, April 21-25, 2014.

34. **Ashley, C E**; Carnes, EC; Anderson, MR; Fleig, PF; Padilla, DP.; Lino, CA.; Heisey, T.; Gomez, A.; Bouvie, C.; Reed, ST.; Jackson, M.; Melo, CF; Wilkinson, B S: In Vivo Delivery Applications of Porous Nanoparticles. In UNM College of Pharmacy - Pharmaceutical Sciences & Toxicology Seminar Series: Albuquerque, NM., 2013. **INVITED.**
35. **Ashley CE**, Epler KE, Negrete O, Padilla D, Willman C, Brinker CJ, and Carnes EC. *Biodefense and Infectious Disease Applications of Mesoporous Silica Nanoparticle-Supported Lipid Bilayers ('Protocells')*. Sandia Technology Showcase. Albuquerque, NM, September 10, 2013.
36. **Ashley CE**. "*Engineered Nanoparticles for Targeted Cancer Therapy and Microanalysis*". Advanced Failure Analysis Workshop: Emerging Topics in Microelectronics and Biotechnology. Indianapolis, IN, August 4, 2013. **INVITED.**
37. Brinker CJ, **Ashley CE**, Carnes EC, Kaehr BJ, Townson J. NanoEngineered Biotic/Abiotic Materials and Interfaces for Understanding and Controlling Biology and Disease. Bottom-Up Approaches to Nanotechnology, Le Studium® Conference, Loire Valley Institute for Advanced Studies, Orléan, FR, May 29-31, 2013.
38. Brinker CJ, Carnes EC, **Ashley CE**, and Townson JL. *Protocells: Mesoporous Silica Supported Lipid Bilayers for Targeted Delivery of Multicomponent Cargos.* 254th American Chemical Society National Meeting – Division of Polymer Chemistry, Hybrid Materials Symposium. New Orleans, LA, April 7-11, 2013**. INVITED**
39. Brinker CJ, Townson JL, Kaehr BJ, Carnes EC, and **Ashley CE**. *Silica and Cells, A Special Relationship.* 254th American Chemical Society National Meeting – ACS Award in Colloid and Surface Chemistry: Symposium in Honor of Steve Granick. New Orleans, LA, April 7-11, 2013. **INVITED.**
40. Townson J, Lin Yu-Shen, **Ashley CE**, Carnes EC, and Brinker CJ. *Protocells: Mesoporous Silica Nanoparticle. Supported Lipid Bilayers for Targeted Delivery of Multicomponent Cargos to Cancer.* Materials Research Society Spring 2013 meeting, Symposium MM: New Tools for Cancer Using Nanomaterials, Nanostructures, and Nanodevices. San Francisco, CA, April 1-5, 2013. **INVITED.**
41. **Ashley CE**, Epler KE, Townson JL, Brinker CJ, Negrete O, and Carnes EC. *Targeted Delivery of Therapeutic Nucleic Acids to Virally-Infected Host Cells via Mesoporous Silica Nanoparticle-Supported Lipid Bilayers.* Materials Research Society Spring 2013 meeting, Symposium LL: New Hybrid Inorganic-Biological Materials. San Francisco, CA, *April 1-5, 2013.*
42. Epler KE, Padilla D, Townson JL, Brinker CJ, **Ashley CE**, and Carnes EC. *Targeted Delivery of Therapeutic Nucleic Acids to Cancer Cells via Mesoporous Silica Nanoparticle-Supported Lipid Bilayers.* Materials Research Society Spring 2013 meeting, Symposium MM: New Tools for Cancer Using Nanomaterials, Nanostructures, and Nanodevices. San Francisco, CA, April 1-5, 2013.
43. Epler KE, Townson JL, Carnes EC, Chackerian B, Peabody DS, Negrete O, and **Ashley CE**. *Rapid Selection of Nipah and Hendra Virus Vaccine Candidates from a Complex, Random Peptide Library Displayed on Virus-Like Particles of MS2 Bacteriophage.* Materials Research Society Spring 2013 meeting, Symposium OO: Design of Cell Instructive Materials. San Francisco, CA, April 1-5, 2013.
44. **Ashley CE**, Negrete O, Epler KE, Padilla D, Chackerian B, Brinker CJ, and Carnes EC. *Mesoporous Oxide Nanoparticles as a Universal Platform for Antigen Adsorption, Presentation, and Delivery*. Materials Research Society Spring 2013 meeting, Symposium OO: Design of Cell Instructive *Materials*. San Francisco, CA, April 1-5, 2013.
45. **Ashley CE**, Padilla D, Epler KE, Brinker CJ, Townson JL, and Carnes EC. *Selective Long-Term Transfection of Dividing and Non-Dividing Cells using Plasmid DNA-Loaded Mesoporous Silica Nanoparticle-Supported Lipid Bilayers.* Materials Research Society Spring 2013 meeting, Symposium OO: Design of Cell Instructive *Materials*. San Francisco, CA, April 1-5, 2013.
46. Brinker CJ, **Ashley CE**, Carnes EC, Kaehr BJ, Dunphy DR, and Townson JL. *Silica cells: A special Hybrid Interface*. International Conference on Multifunctional, Hybrid and Nanomaterials, Sorrento, Italy, March 3-7, 2013. **INVITED.**

47. Carnes EC, **Ashley CE**, Townson JL, Padilla DP, Lin YS, Wharton WR, Chackerian B, Peabody DS, Willman CL, Brinker CJ. *A Simple, Modular Nanoparticle Platform for Universal Drug Delivery.* NCI Alliance for Nanotechnology in Cancer Annual Principle Investigator's Meeting, Houston TX, November 13-17, 2012.
48. Carnes EC, **Ashley CE**, Epler KE, Townson JL, Brinker CJ, and Negrete O. *Delivery of siRNA to Virally-Infected Host Cells via Biomimetic Nanoparticles.* University of Texas Medical Branch Conference: Emerging Viruses: Disease Models and Strategies for Vaccine Development, Galveston, TX. October 23-24, 2012.
49. **Ashley CE**, Negrete O, Carnes EC, Epler KE, Townson J, Chackerian B, and Peabody DS. *Rapid Selection of Nipah Virus Vaccine Candidates from a Virus-Like Particle Library.* University of Texas Medical Branch Conference: Emerging Viruses: Disease Models and Strategies for Vaccine Development, Galveston, TX. October 23-24, 2012.
50. Carnes EC, **Ashley CE**, Wharton W, Chackerian B, Peabody DS, Willman CL, and Brinker CJ. *A Simple, Modular Nanoparticle Platform for Universal Drug Delivery.* University of New Mexico Health Sciences Center/Small Business Technologies Partnership Venture, Albuquerque, NM, October 18, 2012.
51. **Ashley, Carlee;** Carnes, Eric; Epler, Katharine; Padilla, David; Townson, Jason; Wharton, Walker; and Brinker, C. Jeffrey. *Protocells: Mesoporous silica supported lipid bilayers for targeted delivery of multicomponent cargos to cancer*. Nanoscience and Nanotechnology for Health and Medicine, 224th ACS National Meeting, August 19 - 23, 2012, Philadelphia, PA.
52. **Ashley CE**. *Application of Virus-Like Particles to Monitoring and Treatment of Disease*. Presentation to DARPA Program Manager, DARPA Microsystems Technology Office. Livermore, CA. July 17, 2012. **INVITED.**
53. Epler KE, Wilkinson DC, Castillo R, Padilla DP, Heisey T, Wilkinson BS, Johannes N, Burgard C, Townson JL, Brinker CJ, **Ashley CE**, Carnes EC. *Targeted Delivery of Therapeutic Agents to Hepatocellular Carcinoma via Nanoporous Particle-Supported Lipid Bilayers*. Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2012.
54. Wilkinson D, Wilkinson B, Padilla DP, Burgard C, Carnes EC, **Ashley CE**, Brinker CJ. *Enhanced Cargo Capacity of Therapeutic Agents with Low Aqueous Solubility by Encapsulation in Protocells*. Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2012.
55. Carnes EC, **Ashley CE**, Epler KE, Wilkinson D, Castillo R, Heisey T, Burgard C, Wharton W, Brinker CJ, Willman C. *Targeted Nanoparticle-Supported Lipid Bilayers for the Treatment of Blood Cancers*. Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2012.
56. Buley MD, Epler KE, **Ashley CE**, Willman CL, Grupp S, Brinker CJ, Wharton W, Peabody DS. *Development of a Virus-Like Particle Platform for Affinity Selection and Targeted Delivery of Therapeutic Agents to Cancer.* Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2012.
57. **Ashley CE**, Epler KE, Negrete O, Carnes EC. *Targeted Delivery of Therapeutic RNA to Virally-Infected Host Cells via Nanoporous Particle-Supported Lipid Bilayers (Protocells).* Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2012.
58. **Ashley CE**, Carnes EC, Epler KE, Castillo R, Padilla DP, Townson J, Wharton W, Brinker CJ. *Protocells: Nanoporous nanoparticle supported lipid bilayers for targeted delivery of multicomponent cargos to cancer*. Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2012. **INVITED.**
59. **Ashley CE**. *Engineered Nanoparticles for Targeted Cancer Therapy*. Materials Science & Technology (MS&T) External Program Review, Sandia National Laboratories, Livermore, CA. March 6, 2012.
60. **Ashley CE**, Carnes EC, Epler KE, Padilla DP, Kalinich RM, Benhur L, Negrete O. *Targeted Delivery of Therapeutic Nucleic Acids to Virally-Infected Host Cells via Nanoporous Particle-Supported Lipid Bilayers*. Bioscience Advisory Panel meeting, Livermore, CA. January 24, 2012.

61. Buley MD, **Ashley CE**, Wharton W, Peabody DS, Brinker CJ. *A Virus-Like Particle Platform for Affinity Selection and Targeted Delivery of Therapeutics*. Materials Research Society Fall Meeting, Boston, MA. November 28 – December 2, 2011.
62. **Ashley, CE**, Carnes EC, Padilla DP, Epler K, Castillo RE, Willman CL, Chackerian B, Peabody DS, Wharton W, and Brinker CJ. *Targeted Delivery of Multicomponent Cargos to Cancer via Nanoporous Particle-Supported Lipid Bilayers*, Materials Research Society Fall Meeting, Boston, MA. November 28 – December 2, 2011.
63. Carnes EC, **Ashley CE**, Epler KE, Padilla DP, Kalinach RM, Burgard C, Branda S, and Negrete O. *Targeted Delivery of Therapeutic Nucleic Acids to Virally-Infected Host Cells via Nanoporous Particle-Supported Lipid Bilayers (Protocells),* Chemical and Biological Defense Science and Technology (CBD S&T) Conference, Las Vegas, NV. November 14-18, 2011.
64. **Ashley CE**, Carnes EC, Epler KE, Branda S, Negrete O, Chackerian B, and Peabody DS. *Affinity Selection of Nipah Virus Vaccine Candidates from a Complex Random Peptide Library Displayed on Virus-Like Particles of MS2 Bacteriophage*, Chemical and Biological Defense Science and Technology (CBD S&T) Conference, Las Vegas, NV. November 14-18, 2011.
65. Harper JC, Khripin C, Carnes EC, **Ashley CE**, Kaehr BJ, Edwards TL, Brozik SM, Brinker CJ. *Functional Bio-Nano Interfaces: Integrating Living Cells into 3D Nanomaterials),* Chemical and Biological Defense Science and Technology (CBD S&T) Conference, Las Vegas, NV. November 14-18, 2011.
66. Padilla DP, Epler KE, Castillo RE, Wilkinson D, Burgard C, Wilkinson B, Willman CL, Carnes EC, Brinker CJ, and **Ashley CE**; *Porous Nanoparticle-Supported Bilayers (Protocells) for Targeted Gene Therapy to Hepatocarcinoma.* 23rd Annual Rio Grande Symposium on Advanced Materials, Albuquerque, NM. October 2011.
67. Castillo RE, Epler KE, Padilla DP, **Ashley CE**, Burgard C., Wilkinson B, Wharton W, Willman CL, Brinker CJ and Carnes EC. *Peptide-Targeted Protocells for Treatment of Childhood Leukemia,* 23rd Annual Rio Grande Symposium on Advanced Materials, Albuquerque, NM. October 2011.
68. Wilkinson D, Epler KE, Castillo RE, **Ashley CE**, Padilla DP, Burgard C, Wilkinson B, Carnes EC, Willman CL, and Brinker CJ. *The Development of a Targeted Nanoparticle for Selective Drug Delivery to Cancer.* 23rd Annual Rio Grande Symposium on Advanced Materials, Albuquerque, NM. October 2011.
69. **Ashley CE**, Carnes EC, Epler KE, Castillo RE, Wilkinson D, Padilla DP, Wilkinson B, Wharton W, Willman CL, and Brinker CJ. *Targeted Delivery of Therapeutic and Diagnostic Agents to Cancer using Nanoporous Particle-Supported Lipid Bilayers (Protocells),* 23rd Annual Rio Grande Symposium on Advanced Materials, Albuquerque, NM. October 2011.
70. **Ashley CE**, *Engineered Virus-Like Particles for Pathogen Detection, Vaccination, and Targeted Delivery of Therapeutics*, Sandia National Laboratories LDRD Day 2011, Albuquerque, NM. September 14, 2011. **INVITED.**
71. **Ashley CE**, Carnes EC, Peabody DS and Brinker CJ. *Targeted Delivery of Therapeutic Agents to Infected Host Cells via Engineered Virus-Like Particles and Nanoporous Particle-Supported Lipid Bilayers*, Sensing, Multi-phased, Aimed, Responding Transport (SMART) – Drug Delivery Systems (DTRA), Springfield, VA. August 3-4, 2011. **INVITED.**
72. **Ashley CE**, Carnes EC, Padilla DP, Epler KE, Castillo RE, Kalinach, R, Wilkinson D, Wilkinson B, Burgard C, Willman CL, Chackerian B, Wharton W, Peabody DS and Brinker CJ. *Targeted Nanoporous Particle Supported Lipid Bilayers for Treatment of Childhood Leukemia,* Cancer Nanotechnology Gordon Research Conference, Waterville, ME. July 17-22, 2011.
73. **Ashley CE**, Carnes EC, Phillips GK, Durfee PN, Buley MD, Lino CA, Padilla DP, Phillips B, Carter MB, Willman CL, Brinker CJ, Caldeira J do Carmo, Chackerian B, Wharton W, and Peabody DS. *Cell-Specific Delivery of Diverse Cargos by Bacteriophage MS2 Virus-Like Particles,* Nanoparticle Human

Interactions Symposium, Sandia National Laboratories/UNM Cancer Center, Albuquerque, NM. June 2-3, 2011. **INVITED.**

74. Carnes EC, **Ashley CE**, Townson J, Jensen A, Padilla DP, Castillo RE, Epler KE, Wilkinson D, Burgard C, Chackerian B, Wharton W, Peabody DS, and Brinker CJ. *The Development of a Universal Nanocarrier for Targeted Delivery of Therapeutic and Diagnostic Agents to Various Types of Cancer.* Nanoparticle Human Interactions Symposium, Sandia National Laboratories/UNM Cancer Center, Albuquerque, NM. June 2-3, 2011.
75. Castillo RE, Epler KE, Carnes EC, **Ashley CE**, Wilkinson D, Burgard C, Chackerian B, Wharton W, Peabody DS, and Brinker CJ. *Nanoporous-Supported Lipid Bilayer Nanocarriers for Treatment of Childhood Leukemia*. Nanoparticle Human Interactions Symposium, Sandia National Laboratories/UNM Cancer Center (poster), Albuquerque, NM. June 2-3, 2011.
76. Padilla D, **Ashley CE**, Carnes EC, Epler KE, Castillo RE, Bouvie C, Wilkinson D, Johannes N, and Brinker CJ. *Development of Porous Nanoparticle-Supported Lipid Bilayers (Protocells) for Targeted Delivery of Plasmid DNA to Hepatocellular Carcinoma.* Nanoparticle Human Interactions Symposium, Sandia National Laboratories/UNM Cancer Center (poster), Albuquerque, NM, June 2-3, 2011.
77. Padilla DP, **Ashley CE**, Carnes EC, Epler KE, Castillo RE, Bouvie C, Wilkinson D, Johannes N, and Brinker CJ. *Development of Porous Nanoparticle-Supported Lipid Bilayers (Protocells) for Targeted Delivery of Plasmid DNA to Hepatocellular Carcinoma.* American Vacuum Society – The Science & Technology Society, Albuquerque, NM. May 24, 2011. **(Best Poster Award).**
78. Carnes EC, **Ashley CE**, Townson J, Jensen A, Padilla P, Castillo RE, Epler KE, Wilkinson D, Burgard C, Chackerian B, Wharton W, Peabody DS, and Brinker CJ. *The Development of a Universal Nanocarrier for Targeted Delivery of Therapeutic and Diagnostic Agents to Various Types of Cancer.* Materials Research Society Spring Meeting, San Francisco, CA. April 25-29, 2011.
79. Castillo RE, Epler KE, Carnes EC, **Ashley CE**, Wilkinson D, Burgard C, Chackerian B, Wharton W, Peabody DS, and Brinker CJ. *Nanoporous-Supported Lipid Bilayer Nanocarriers for Treatment of Childhood Leukemia*. Materials Research Society Spring Meeting, San Francisco, CA. April 25-29, 2011.
80. Padilla DP, **Ashley CE**, Carnes EC, Epler KE, Castillo RE, Bouvie C, Wilkinson D, Johannes N, and Brinker CJ. *Development of Porous Nanoparticle-Supported Lipid Bilayers (Protocells) for Targeted Delivery of Plasmid DNA to Hepatocellular Carcinoma.* Materials Research Society Spring Meeting, San Francisco, CA. April 25-29, 2011.
81. **Ashley CE**, Negrete O, Chackerian B, Peabody DS, and Singh A. *Use of Virus-Like Particles in Targeted Drug Delivery and Vaccine Development*. BioScience Advisory External Review Panel, Sandia National Laboratories, Albuquerque, NM. January 12-14, 2011.
82. **Ashley CE**, *In Vitro Construction of Complex Random Peptide Libraries Displayed on Virus-Like Particles for Use in Rapid Response to Emerging Pathogens and Biowarfare Agents*. Chemical and Biological Defense Science and Technology Conference, Orlando, FL. November 15-19. 2010.
83. Brinker CJ, **Ashley CE,** Carnes EC, Khripin C, Kaehr BJ. *Directing Sol-Gel Processing with Proteins and Living Cells*. Robert B. Sosman Award Lecture, American Ceramics Society, Materials Science and Technology 2010 Conference, Houston, TX. October 17-21, 2010. **INVITED.**
84. Castillo R, Epler KE, Wilkinson D, Johannes N, Jensen A, **Ashley CE**, Carnes EC, Brinker CJ. *A New Approach to Cancer Therapeutics using Nanoparticle-Based Targeted Drug Delivery*. 22nd Rio Grande Symposium on Advanced Materials, Albuquerque, NM. October 11, 2010. **(1st place poster award).**
85. Brinker CJ, **Ashley CE,** Carnes EC, Kaehr BJ. *Engineered Biotic/Abiotic Materials and Interfaces for Understanding and Controlling Biology*. California NanoSystems Institute - CNSI, University of California, Los Angeles, CA. April 23, 2010. **INVITED.**

86. Carnes EC, **Ashley CE**, Townson JL, Kaehr BJ, and Brinker CJ. *3D Environmental Effects on Cell Behavior – A link between in-vitro and in-vivo studies*. NIH 4th Annual NDC Awardee Meeting, Pacific Grove, CA. April 5-8, 2010.
87. **Ashley CE**, Carnes EC, Padilla DP, Brown PA, Hanna TN, Liu J, Wharton W, Peabody DS, Parikh AN, and Brinker CJ. *Multivalent peptide display on engineered nanoparticles (virus-like particles and silica nanoparticle-supported lipid bilayers) facilitates highly specific targeted delivery of therapeutic agents to bacterial and mammalian cells*. NIH 4th Annual NDC Awardee Meeting, Pacific Grove, CA. April 5-8, 2010.
88. Carnes EC, **Ashley CE**, Wharton W, Castillo RE, Lee TM, Brinker CJ. *Nanoconfinement-induced viability, dormancy, and drug resistance of cancer cells*. Materials Research Society Spring Meeting, San Francisco, CA. April 5-19, 2010.
89. **Ashley CE**, Dunphy DR, Petsev DN, Atanassov P, Wang J, Peabody DS, Brinker CJ. *In-situ GISAXS characterization of 2D virus-like particle VLP arrays deposited via convective assembly*. Materials Research Society Spring Meeting, San Francisco, CA. April 5-9, 2010.
90. **Ashley CE,** Wharton W, Peabody DS, Brinker CJ. *Development of a virus-like particle platform that integrates phage display and targeted delivery capabilities*. Materials Research Society Spring Meeting, San Francisco, CA. April 5-9, 2010.
91. **Ashley CE**, Padilla DP, Brown PA, Carnes EC, Chackerian B, Wharton W, Peabody DS, Brinker CJ. *Development of a universal nanoparticle-based platform for targeted delivery of multicomponent cargos to cancer*. Materials Research Society Spring Meeting, San Francisco, CA. April 5-9, 2010.
92. **Ashley CE**, Peabody DS, and Brinker CJ. *Design of a Targeted Virus-like Particle (VLP) Carrier for Delivery of Nanoparticles, Chemotherapeutic Agents, and siRNA to Human Cancer Cells.* Materials Research Society Fall Meeting, Boston, MA. November 30 - December 4, 2009.
93. **Ashley CE**, Liu J, Peabody DS, and Brinker CJ. *Multivalent Peptide Display on Model Engineered Nanoparticles (Virus-Like Particles and Silica Nanoparticle-Supported Lipid Bilayers) for Highly Specific Targeted Delivery of Diagnostic and Therapeutic Agents to Human Cancer Cells.* Materials Research Society Fall Meeting, Boston, MA. November 30 - December 4, 2009. **(Graduate student award presentation)**
94. **Ashley CE**, Carnes EC, Phillips G, Padilla DP, Brown P, Liu J, Peabody DS, and Brinker CJ. *Multivalent Peptide Display on Model Engineered Nanoparticles- Virus-Like Particles and Silica Nanoparticle-Supported Lipid Bilayers (Protocells).* 2009 Chemical and Biological Defense Science and Technology (CBD S&T) Conference, Dallas, TX. November 16-20, 2009.
95. Lee TL, Carnes EC, Castillo R, **Ashley CE**, Lopez DM, and Brinker CJ. *Metabolically Controlled 3D Cellular Integration into Lipid Silica Films*, American Institute of Chemical Engineers 2009 Annual meeting, Nashville, TN. November 9-13, 2009.
96. **Ashley CE** and Carnes EC. *Development of a Universal Nanoparticle-Based Platform for Targeted Delivery of Multicomponent Cargos to Cancer*. University of New Mexico Cancer Center/Fluorescence Microscopy Facility Annual Open House, Albuquerque, NM. November 5, 2009. **INVITED.**
97. Padilla D, **Ashley CE**, Carroll N, Brown P, Hanna T, Petsev D, and Brinker CJ. *Development of Silica Nanoparticle-Supported Bilayers (Protocells) for Targeted Delivery of Therapeutic and Imaging Agents to Hepatocarcinoma*. Rio Grande Symposium on Advanced Materials – RGSAM, Albuquerque, NM. October 5, 2009.
98. Khripin C, Harper JC, **Ashley CE**, Karlin S, Carnes EC, and Brinker CJ. *Cell formation of silica-lipid shells for enhanced cell viability in desiccated conditions.* The 238th ACS National Meeting, Frontiers in Chemical Biology Symposium, Washington, DC. August 16-20, 2009.

99. Brinker CJ (MRS Fellow invited talk presented by **CE Ashley** in CJB absence due to surgery). *Sol-Gel Strategies for Optimized Hierarchical Materials.* Materials Research Society Spring Meeting, Architectured Multifunctional Materials Symposium, San Francisco, CA. April 12-17, 2009.
100. Johnson P, Carnes EC, **Ashley CE**, Lopez DM, Timmins G, and Brinker CJ. *Lithography with Life: A New Means of Patterned Cellular Integration into Self-Assembled Nanostructures,* Materials Research Society Spring Meeting, San Francisco, CA. April 12-17, 2009.
101. Carnes EC, Harper JC, **Ashley CE**, Lopez DM, Douthit CM, Karlin S, Pelowitz J, Khripin C, and Brinker CJ. *Metabolically and Optically Controlled 3D Cellular Integration - Lithography with Life.* Materials Research Society Spring Meeting, San Francisco, CA. April 12-17, 2009.
102. **Ashley CE**, Peabody DS, and Brinker CJ. *Development of an Icosahedral Virus-like Particle Platform for Peptide Display and Investigation of Biomimetic Silica Condensation Kinetics.* Materials Research Society Spring Meeting, San Francisco, CA. April 12-17, 2009.
103. Brinker CJ, **Ashley CE**, LaVan D, Liu J, Moscone A, Parikh AN. *Design, Self-Assembly, Physics and Function of Protocells.* NIH Nanomedicine Development Centers 3rd Annual Meeting, Bethesda, MD. April 5-7, 2009.
104. Brinker CJ, Liu J, **Ashley CE**, LaVan DA, Feng Y, Kenney L, Moscone A, Porotto M, and Jakobsson E. *Applications for Protocells.* NIH Nanomedicine Development Centers 3rd Annual Meeting, Bethesda, MD. April 5-7, 2009.
105. Liu J, **Ashley CE**, Peabody D, Brinker CJ. *Protocells and Virus-Like Particles – Multifunctional, Multivalent Nanoscale Systems for Targeted Delivery.* NIH Nanomedicine Development Centers 3rd Annual Meeting, Bethesda, MD. April 5-7, 2009.
106. **Ashley CE**, Liu J, Peabody DS, and Brinker CJ. *Protocells and Virus-Like Particles for Cancer Diagnosis and Therapy.* NIH Nanomedicine Development Centers 3rd Annual Meeting, Bethesda, MD. April 5-7, 2009.
107. **Ashley CE,** Dunphy DR, Petsev D, Atanassov P, Peabody D, and Brinker CJ. *Self-Assembly of Well-Ordered, Close-Packed 2D Arrays of Recombinant Virus-Like Particles that Nucleate the Growth of Inorganic Nanomaterials.* Materials Research Society Fall Meeting, Boston, MA. December 1-5, 2008.
108. **Ashley CE,** Carnes EC, Dunphy DR, Petsev D, Atanassov P, Peabody D, and Brinker CJ. *In-Situ Grazing Incidence Small Angle X-ray Scattering (GISAXS) Characterization of 2D Bacteriophage Arrays Deposited via Convective Assembly.* Materials Research Society Fall Meeting, Boston, MA. December 1-5, 2008.
109. **Ashley CE,** Buley M, Peabody D, and Brinker CJ. *Targeted In-Vitro Drug Delivery of a Chemotherapeutic Agent to Human Hepatocellular Carcinoma via a Bacteriophage Carrier*. Materials Research Society Fall Meeting, Boston, MA. December 1-5, 2008.
110. Karlin S, Harper JC, Carnes EC, **Ashley CE**, Lopez DM, Douthit CM, Pelowitz J, Lee T, Capecelatro A, Horgan A, Dunphy D, Brozik S, and Brinker CJ. *Nanostructure Enhanced Cell Survival and Metabolism.* American Institute of Chemical Engineers (AIChE) Conference, Philadelphia, PA. November 17, 2008.
111. Douthit CM, Carnes EC, **Ashley CE**, Lopez DM. Douthit, Capecelatro, A, and Brinker CJ. *Examining Integration Techniques using Living Yeast Cells into Self-Assembled Nanostructures.* American Institute of Chemical Engineers (AIChE) Conference, Philadelphia, PA. November 17, 2008.
112. **Ashley CE**, Peabody D, and Brinker CJ. *Targeted In-Vitro Drug Delivery of a Chemotherapeutic Agent to Human Hepatocellular Carcinoma via a Bacteriophage Carrier*. National Center for Design of Biomimetic Nanoconductors, NIH All-Hands Meeting, Indianapolis, IN. November 6-8, 2008.
113. Liu J, **Ashley CE**, Jiang YB, Jiang XM, Brinker CJ, Peabody D, Kenney L, and Parikh AN. *Protocells for Drug Delivery*. National Center for Design of Biomimetic Nanoconductors, NIH All-Hands Meeting, Indianapolis, IN. November 6-8, 2008.

114. **Ashley CE**, Buley M, Liu J, Lee T, Phillips G, Crowder B, Howard T, Peabody D, and Brinker CJ. *Targeted In-Vitro Drug Delivery of a Chemotherapeutic Agent to Human Hepatocellular Carcinoma*. National Center for Design of Biomimetic Nanoconductors, NIH All-Hands Meeting, Indianapolis, IN. November 6-8, 2008.
115. **Ashley CE**, Buley M, Wharton W, Peabody D, and Brinker CJ. *Targeted In-Vitro Drug Delivery to Human Hepatocarcinoma via a Bacteriophage Carrier*. 20th Annual Rio Grande Symposium on Advanced Materials – RGSAM, Albuquerque, NM. September 24, 2008.
116. **Ashley CE**, Petsev D, Atanassov P, Peabody D, and Brinker CJ. *Grazing Incidence Small Angle X-ray Scattering (GISAXS) Characterization of 2D Self-Assembled Bacteriophage Arrays Deposited via a Convective Transport Process.* 2008 ACS Colloid and Surface Science Symposium, Raleigh, NC. June 15-18, 2008.
117. **Ashley CE**, Dunphy DR, Petsev D, Atanassov P, Peabody D, and Brinker CJ. *Self-Assembly of Well-Ordered, Close-Packed 2D Arrays of Recombinant Virus-Like Particles that Nucleate the Growth of Inorganic Nanomaterials*. NSF Integrative Graduate Education and Research Traineeship (IGERT) PI Symposium, Arlington, VA. May 18-20, 2008.
118. Jiang YB, Chen Z, Kissel DJ, Xiong S, Liu J, **Ashley CE,** Carnes EC, Dunphy DR, Sewell RM, Cecchi JL, and Brinker CJ. *Atomic Layer Deposition of Hybrid or Microporous Low-k Materials.* Materials Research Society Spring Meeting, San Francisco, CA.
March 24-28, 2008.
119. Capecelatro A, Carnes EC, Karlin S, Douthit C, **Ashley CE,** Dunphy DR, Harper JC, Brinker CJ. *Patternable Cell Directed Integration.* Materials Research Society Spring Meeting, San Francisco, CA. March 24-28, 2008.
120. **Ashley CE,** Pelowitz J, Carnes EC, Petsev D, Atanassov P, Peabody D, and Brinker CJ. *Self-Assembly of Well-Ordered, Close-Packed Arrays of Recombinant Virus-Like Particles that Nucleate the Growth of Inorganic Nanomaterials*. Bioscience and Technology Forum, Sandia National Laboratories, Albuquerque, NM. February 6, 2008.
121. Carnes EC, **Ashley CE**, Lopez DM, Douthit C, Karlin S, Pelowitz J, Capecelatro A, Harper JC, Dunphy DR, Gresham H, Timmins G, and Brinker CJ. *Lithography with Life: A New Means of Patterned Cellular Integration into Self-Assembled Nanostructures*. Bioscience and Technology Forum, Sandia National Laboratories, Albuquerque, NM. February 6, 2008.
122. Carnes EC, **Ashley CE**, Lopez D, Douthit C, Pelowitz J, Karlin S, Capecelatro A, Dunphy D, Timmins G, and Brinker CJ. *Lithography with Life: A New Means of Patterned Cellular Integration into Self-Assembled Nanostructures.* HK IAS – US ICMR Workshop on Advanced Materials, HKUST, Hong Kong. September 12-15, 2007.
123. Douthit CM, Carnes EC, **Ashley CE**, Lopez D, Karlin S, Pelowitz J, Capecelatro A, Dunphy D, Gresham H, Timmins G, and Brinker CJ. *Integrating Living Yeast Cells into Self-Assembled Nanostructures.* 19th Annual Rio Grande Symposium on Advanced Materials – RGSAM, Albuquerque, NM. October 9, 2007.
124. Brinker CJ, Baca HK, Carnes EC, Singh S, **Ashley CE**, Lopez DM. *Directing the Self-Assembly of Nanostructured Sol-Gel Films with Living Cells.* XIVth International Sol-Gel Conference, Montpellier, France. September 2-7, 2007.
125. Carnes EC, **Ashley CE**, Lopez DM, Douthit CM, Karlin S, Pelowitz J, Singh S, Dunphy DR, Gresham H, Timmins G, Brinker CJ. *Integration of Living Cells in Self-Assembled Nanostructures: A Platform for Single-Cell Interrogation.* 2007 Joint ACS AIChE Rocky Mountain Regional Meeting, Denver, CO. August 29th – September 1, 2007.
126. Carnes EC, **Ashley CE**, Lopez DM, Douthit CM, Singh S, Dunphy DR, Brinker CJ. *Integration of Living Cells within Self-Assembled Nanostructures.* 1st Annual Symposium on Integrating

Nanotechnology with Cell Biology and Neuroscience, Albuquerque, NM.
August 15, 2007.

127. **Ashley CE**, Dunphy DR, Atanassov P, Petsev D, and Brinker CJ. *Grazing Incidence Small Angle X-Ray Scattering (GISAXS) Characterization of 2D Bacteriphage Arrays Deposited via Convective Assembly*. 43rd Annual Symposium American Vacuum Society, Graduate Student Oral Paper Competition, Albuquerque, NM. May 2007. **1st Place award, Best paper (paid trip to AVS 54th International Symposium in Seattle)**.

128. Carnes EC, **Ashley CE**, Lopez DM, Douthit CM, Singh S, Dunphy DR, and Brinker CJ. *Integration of Living Cells within Self-Assembled Nanostructures.* 43rd Annual Symposium New Mexico Chapter of the American Vacuum Society, Albuquerque, NM. May 21-22, 2007. **(Student poster competition 1st prize)**

129. Carnes EC, **Ashley CE**, Lopez DM, Baca H, Singh S, Dunphy DR, and Brinker CJ. *Cell-Directed Assembly: A New Means of Bio/Nano Integration.* Center for Integrated Nanotechnologies (CINT) Annual Program Review, Sandia National Laboratories, Albuquerque, NM. April 18-20, 2007.

130. **Ashley CE**, Carnes EC, Lopez DM, Douthit CM, Karlin SA, Pelowitz J, Gresham H, Timmins G, Chen L, Yuan Z, Jiang YB, Caldera J, Petsev D, Atanassov P, Peabody DS, and Brinker CJ. *Co-Assembly of Genetically-Modified Viruses and Metal Nanoparticles into 3D Arrays via a Novel Deposition Technique.* Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2007.

131. Carnes EC, **Ashley CE**, Lopez DM, Douthid CM, Karlin SA, Pelowitz J, Gresham H, Timmins G, and Brinker CJ. *Patternable Integration of Living Cells with Self-Assembled Nanomaterials*. Materials Research Society Spring Meeting, San Francisco, CA. April 9-13, 2007.

132. Carnes EC, **Ashley CE**, Lopez DM, Douthit CM, Karlin S, Pelowitz J, Wise A, Singh S, and Brinker CJ. *Creation of Integrated Platforms for Engineered Cell-Cell Communication via Cell Directed Assembly*. Materials Research Society Fall 2006 Meeting, Boston, MA. November 27-December 1, 2006.

133. Brinker CJ, Carnes EC, **Ashley CE**, Singh S. *Engineered Bio/Nano Interfaces via Cell-directed Assembly*. Materials Research Society Fall 2006 Meeting, Boston, MA. November 27-December 1, 2006.

134. Douthit CM, Carnes EC, **Ashley CE**, Lopez DM, Pelowitz J, Karlin SA, Brinker LM, and Brinker CJ. *In-Situ Genetic Modification through Cell-Directed Assembly.* 18th Annual Rio Grande Symposium on Advanced Materials – RGSAM, Albuquerque, NM. October 10, 2006.

135. **Ashley CE**, Lopez DM, Carnes EC, Baca HK, Singh S, and Brinker CJ. *Cellular Integration into Functional Hierarchical/Multiscale Devices*. 42nd Annual Symposium New Mexico Chapter of the American Vacuum Society, Albuquerque, NM. May 23-24, 2006.

136. **Ashley CE**, Carnes EC, Lopez DM, Baca HK, Fan HY, Singh S, and Brinker CJ. *Cellular Integration into Functional Hierarchical/Multiscale Devices*. Materials Research Society Spring Meeting, San Francisco, CA. April 17-21, 2006.

137. Carnes EC, **Ashley CE**, Lopez DM, Singh S, Fan HY, and Brinker CJ. *Functional Bio/Nano Interfaces through Cell-Directed Assembly*. Materials Research Society Spring Meeting, San Francisco, CA. April 17-21, 2006.

138. Baca HK, **Ashley CE**, Carnes EC, Singh S, and Brinker CJ. *Complex Structures and Functions through Cell-Directed Assembly*. AFOSR Biomimetic, Biomaterials, and Biointerfacial Sciences Program Review, Duck Key, FL. January 2-6, 2006.

139. Leve E, Boyle TJ, Brinker CJ, Fan HY, Carnes EC, **Ashley CE**, and Timmins GS. *Surfactant-Assisted Self-Assembly of Water-Soluble Fluorescent Semiconductor Nanocrystals and Magnetic Nanocrystals for Biological Applications*. 17th Annual Rio Grande Symposium on Advanced Materials – RGSAM, Albuquerque, NM. October, 11, 2005.

140. Baca HK, Carnes EC, **Ashley CE**, Lopez DM, Singh S, and Brinker CJ. *Cell-Directed Assembly of the 3D Bio-Nano Interface.* Center for MicroEngineered Materials Industrial Advisory Board Meeting, Albuquerque, NM. October 6, 2005.
141. Baca HK, Carnes EC, **Ashley CE**, Lopez DM, Singh S, and Brinker CJ. *Cell-Directed Assembly of 3D Bio-Nano Interfaces.* Materials Research Society Multifunctional Ceramic Composites Workshop, Urbana, IL. October 3-5, 2005.
142. **Ashley CE**, Baca HK, Carnes EC, Lopez DM, Singh S, and Brinker CJ. *Cell-Directed Assembly of 3D Bio-Nano Interfaces.* 18th Annual NSF/EPSCoR National Conference, Rio Grande, Puerto Rico. September 25-28, 2005.
143. Baca HK, **Ashley CE**, Carnes EC, Singh S, and Brinker CJ. *Complex Structures and Functions through Cell-Directed Assembly*. 13th International Workshop on Sol-Gel Science and Technology, Los Angeles, CA. August 21-26, 2005.
144. **Ashley CE**, Baca HK, Wongsarnpigoon A, Petrosian A, Carnes EC, Lopez DM, Reed ST, and Brinker CJ. *Cell-Immobilization through Optically-Directed Patterning*. Sandia National Laboratories Student Intern Symposium, Albuquerque, NM. August 2, 2005.
145. Baca HK, Carnes EC, **Ashley CE**, Lopez DM, and Brinker CJ. *The Development of Complex, Functional Structures through Cell-Directed Self-Assembly.* 2005 Users Meeting for the Advanced Photon Source and the Center for Nanoscale Materials, Argonne National Laboratory, Argonne, IL. May 2-6, 2005.
146. Baca HK, Carnes EC, **Ashley CE**, Lopez DM, and Brinker CJ. *Developing Complex, Functional Structures through Cell-Directed Self-Assembly.* Materials Research Society Spring Meeting, San Francisco, CA. March 28-April 1, 2005.

Funding – Active, Pending, Recently Completed

Active:

Sandia National Laboratories, LDRD 173110, $1.3M, 1(CE Ashley/EC Carnes, co-PIs) 10/1/2013 – 9/30/2016
Enabling Pretreatment of CNS Nerve Agent Countermeasures using Novel Nanoparticles Delivery Vehicles
Project goal: The goal of this research is to adapt mesoporous silica nanoparticle-supported lipid bilayers (protocells) for delivery of acetylcholinesterase reactivators and organophosphorus nerve agent bioscavengers.
Role: Proposal author, PI

Sandia National Laboratories, LDRD Grand Challenge, $14M (CE Ashley, PI), 10/1/2015 – 9/30/2017
NanoCRISPR: A revolutionary technology to combat natural and synthetic pathogens
Project Goal: We propose to develop a novel nanoparticle-based deployment system for large nucleic acids and enzymes to realize therapeutic potential of CRISPR/Cas9 technology
Role: Project PI, Technical and cost proposal author, overall project management, plan/schedule/budget/deliverables, lead multiple research teams, present to internal/external advisory boards; primary technical contact with CTO's office.

DTRA JSTO-CBD CBM-08, $5M (O. Negrete, PI), 7/1/2016 – 6/30/2019
Development of Mesoporous Silica Nanoparticle-Supported Lipid Bilayers ('Protocells') for Delivery of Antivirals to the Central Nervous System

Project Goal: We are developing materials and methods to stabilize proteins in order to enable more efficient deployment of vaccines and enzyme-based assays to resource-constrained regions of the globe
Role: Lead proposal author, Key personnel

DTRA JSTO-CBD, $1.75M, 7/1/2016 – 12/31/2017
In-Vitro Development of a Mesoporous Silica Nanoparticle-Supported Lipid Bilayer Platform for Targeted Delivery of Therapeutics
Project goal: Expand flexible nanoparticle platform to enable delivery of multiple classes of molecules for next-gen antibiotics
Role: co-PI

Pending:

DTRA JSTO-CBD CBM-09, $6M (JL Santarpia, PI), 10/1/2015 – 9/30/2017
Nanoparticle-Mediated Delivery of Bacteriophages against Burkholderia pseudomallei for Pre-Exposure Prophylaxis and Post-Exposure Treatment of Acute and Chronic Melioidosis
Project Goal: We propose to develop novel nanoparticle/bacteriophage delivery systems to create new therapeutics and prophylactics for bacterial biothreat agents.
Role: Lead proposal author – in *vitro/in vivo* technical lead

DTRA JSTO-CBD CBM-T-01, 1/1/16 – 12/31/18 (Currently on SAF list)
Development of Mesoporous Silica Nanoparticle-Supported Lipid Bilayers ('Protocells') for Delivery of Antivirals to the Central Nervous System
Project Goal: We are developing materials and methods to stabilize proteins in order to enable more efficient deployment of vaccines and enzyme-based assays to resource-constrained regions of the globe.
Role: co-PI; Technical Lead, *in vivo/in vitro* studies

Recently Completed:

DTRA JSTO-CBD NATV, $2.6M (originally $11M) (CJ Brinker, PI), 10/1/2013 – 9/30/15
Development of a Mesoporous Silica Nanoparticle-Supported Lipid Bilayer Platform for Targeted, Triggered, Sustained, and Systemic Delivery of Antibiotics
Project Goal: We propose to develop mesoporous silica nanoparticle-supported lipid as a flexible, modular platform for targeted, triggered, sustained, and systemic delivery of a variety of FDA-approved antibiotics to cells, tissues, and organs infected with Gram-negative, facultative intracellular pathogens.
Role: Proposal author; one of two project technical leads; manage 22 person research team; primary technical contact with sponsor.

DTRA, CB-SEED-25 (Carnes, PI), $500K, 10/1/2013 – 3/31/15
Mesoporous Alum Nanoparticles as a Universal Platform for Antigen Adsorption, Presentation and Delivery
Project Goal: We propose to synthesize high-surface-area mesoporous alum nanoparticles (MANPs) that facilitate facile adsorption and presentation of antigens isolated from several Category A and B biothreat agents; we will load MANPs with cocktails of antigen(s) and immunostimulatory RNA (isRNA) and encapsulate them within a supported lipid bilayer (SLB).

Role: Proposal co-author, co-PI

Sandia National Laboratories, LDRD 171055, $1.25M Carnes (PI) 5/1/2013 – 9/30/2014
Breaking Antibiotic Resistance: Use of High-Throughput, Multi-Dimensional Data Analyses and Revolutionary Advances in Engineered Nanoparticles to Design and Deliver Antisense RNA
Project Goal: This research drew from diverse scientific disciplines -- biology, physics, chemistry, mathematics, computer science, and many engineering disciplines – to develop a universal delivery vehicle capable of both verifying predictive genomic analyses and effectively treating infections caused by the so-called 'superbugs.
Role: co-PI

NIH-NCI, Cancer Nanotechnology Platform Partnerships U01, $1.2M C.L. Willman, MD, UNM Cancer Center; C.J. Brinker, ChNE (coPIs) , 9/1/2010 – 8/31/2015
Peptide-directed Protocells and Virus-Like Particles – new nanoparticle platforms for targeted delivery of multicomponent drugs
Project goal: Our proposed research addresses the full spectrum of challenges underlying nanocarriers as targeted delivery platforms for cancer therapy. It couples unique genomic insight and renowned clinical experience on Acute Lympoblastic Leukemia (ALL) with two new, powerful and versatile targeted nanoparticle delivery systems – protocells (nanoporous nanoparticle supported lipid bilayers) and virus-like particles(VLPs) – each directed with peptides identified by a high complexity VLP affinity selection technology.
Role: key contributor

NIH R01, Exceptional, Unconventional Research Enabling Knowledge Acceleration (EUREKA), RFA-GM-11-003; $296K, co-PIs: E. Jakobsson, U. IL; C.J. Brinker. UNM; 9/1/2011 – 8/30/2015
Development of Functional Protocells and Virus-Like Particles for Drug-Resistant Bacteria
Project goal: We will develop lipid coated inorganic nanoparticles (termed functional protocells) and engineered virus-like particles (VLPs) as carriers to deliver antisense nucleic acids into drug-resistant bacteria cells as a novel way to treat bacterial infections.
Role: key contributor

Sandia National Laboratories, Truman Fellowship LDRD 151379 (Carlee Ashley, PI); $775K, 10/1/2010 – 9/30/2013
Biodefense and Emerging Infectious Disease (BEID) Applications of Engineered Nanoparticles
Project goal: The goal of this research is to develop a complex random peptide library entirely in vitro using MS2 virus-like particles as a display platform and then use monoclonal antibodies against Nipah virus to affinity-select VLPs that display peptide mimitopes. VLP display will enable rapid, cost-effective identification of vaccine candidates and targeted nanocarriers in order to effectively combat BEID agents.
Role: Proposal author, PI

Sandia National Laboratories, Early Career LDRD (Carlee Ashley PI); $450K, 10/1/2014 – 9/30/2015
Metal Organic Frameworks for Targeted, Triggered, Sustained, and Systemic Delivery of Antibiotics
Project goal: The goal of this research is to adapt metal organic frameworks (MOFs) for delivery of FDA-approved antibiotics to cells infected with *F. tularensis* and *B. pseudomallei*.
Role: Proposal author, PI